

REMARKS

Claims 1-8 remain pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takizawa et al. (U.S. Pat. No. 6,357,849) in view of Elgee (U.S. Pat. No. 6,877,838). This rejection is respectfully traversed.

Independent Claims 1, 5, 6 and 8 recite an apparatus and method for detecting droplets discharged from discharge nozzles provided in a discharge head. Each of these claims requires settings to be adjusted so as to satisfy the conditions:

$$D/2 + d/2 \leq L, \text{ and } H \leq D$$

wherein D is the diameter of a beam of detection light, d is the diameter of the droplets, L is the distance between the discharge nozzles in the direction of movement of the discharge head, and H is the relative distance that the discharge head and the detection apparatus move from when a discharge nozzle discharges one droplet to when the discharge nozzle discharges the next droplet.

Claims 1, 5, 6 and 8 also require placing only one droplet discharged from each discharge nozzle onto the optical path of the detection light. Support for this requirement can be found at least at page 5, lines 15-19 of the description which states that "According to the aspects described above, by optically detecting droplets discharged from discharge nozzles in a state where the above-described conditions are

satisfied, it is possible to place only one droplet discharged from each discharge nozzle onto the optical path of a detection light, so that it is possible to detect accurately whether droplets are discharged from the discharge nozzles normally" and also at page 15, lines 6-9 which states that "By satisfying the above conditions, only one droplet discharged from the discharge nozzles 11 (11A to 11C) is placed on the optical path of the detection light, so that it is possible to detect accurately whether droplets are discharged correctly from the discharge nozzles." Please also refer to FIGS. 5 and 6.

As described in "BACKGROUND OF THE INVENTION" and "SUMMARY OF THE INVENTION", an object of the claimed invention is to provide a detection apparatus and a detecting method for a droplet discharge apparatus that can accurately detect whether a droplet is discharged from a discharge nozzle of the droplet discharge apparatus, and a droplet discharge apparatus. In order to achieve this object, currently amended independent claims 1, 5, 6 and 8 of the present invention recite all three of the following features (a) to (c):

- (a) Settings are adjusted so as to satisfy the conditions
$$D/2 + d/2 \leq L, \text{ and } H \leq D$$
to place only one droplet discharged from each discharge nozzle onto the optical path of the detection light;
- (b) A plurality of discharge nozzles are aligned in an alignment direction parallel to the direction of movement of the discharge head; and
- (c) The discharge nozzles aligned in the alignment direction discharge the droplets at the same time and at a predetermined interval.

According to these features, a constituent of the apparatus or discharge conditions of the ink droplets are suitably set to accurately detect whether the ink droplets are correctly discharged from the discharge nozzles. Namely, an advantageous effect can be obtained that "to place only one droplet discharged from each discharge nozzle onto the optical path of the detection light". That is, one optical path of detection light can always detect only one ink droplet although a plurality of discharge nozzles discharge a plurality of ink droplets simultaneously. Further, functions of the receiver of the detection apparatus are made to output either one of a binary "HIGH" or "LOW" signal based on the output voltage to the control unit. For example, the receiver may output a "HIGH" signal in the case where droplets are situated on the optical path of the detection light, and output a "LOW" signal where droplets are not situated on the optical path of the detection light. Therefore, a simplified construction of the detection apparatus can be obtained although the detection apparatus can perform accurate detection (see page 13, line 12 to page 16, line 11).

In contrast, the above-mentioned features of the claimed invention are not disclosed or suggested by Takizawa et al. and/or Elgee. Both Takizawa et al. and Elgee disclose detection apparatuses in which discharge nozzles discharge a plurality of ink droplets onto one optical path of the detection light so that the optical path enables detection of these ink droplets simultaneously (see column 13, lines 38-50, and FIG. 22, etc. of Takizawa et al., and column 5, lines 28-68, and FIGS. 4-8, etc. of Elgee). It is clear that a simplified construction of these detection apparatuses cannot be obtained. Thus, the scope of Takizawa et al. and Elgee are completely different from

the claimed invention. In fact, the above-mentioned features of the claimed invention are not disclosed or suggested by Takizawa et al. and/or Elgee. Therefore, the above-mentioned advantageous effects of the claimed invention cannot be obtained by Takizawa et al., Elgee, or the combination thereof.

As can be appreciated from the foregoing, the features of independent claims 1, 5, 6 and 8 are not rendered obvious by Takizawa et al., Elgee and/or the combination thereof. Claims 2, 3, 4, and 7 depend from claim 1 or 6 and are not rendered obvious for at least the same reasons as set forth above. Furthermore, none of the claims could have been easily conceived by a person skilled in the art on the basis of the disclosure of Takizawa et al., Elgee, or the combination thereof.

Therefore, all claims should be allowed.

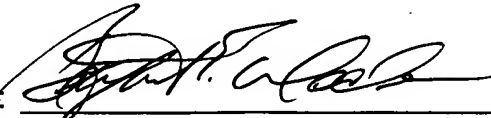
CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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